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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: R13-3341
Plant ID No.: 081-00165
Applicant: Beckley Sanitary Board
Facility Name: Piney Creek Wastewater Treatment Plant
Location: Raleigh County
SIC/NAICS Code: 4952/221320
Application Type: Modification
Received Date: September 21, 2016
Engineer Assigned: Joe Kessler
Fee Amount: \$2,000
Date Received: September 23, 2016
Complete Date: October 20, 2016
Due Date: January 18, 2017
Applicant Ad Date: September 27, 2016
Newspaper: *The Register-Herald*
UTM's: 486.470 km Easting • 4,180.329 km Northing • Zone 17
Latitude/Longitude: 37.77022/-81.15343
Description: Request to add a 9,520 ft³/hr flare to combust excess biogas produced in the existing digesters.

On September 21, 2016, the Beckley Sanitary Board (BSB) applied for a permit to modify the Piney Creek Wastewater Treatment Plant located approximately two (2) miles east of downtown Beckley along Piney Creek Road in Raleigh County, WV. The facility was originally constructed in the 1930's but has been the subject of only one previous permitting action. On August 6, 2002, BSB was issued Permit Number R13-2491 for the installation of an 1,250 kW_e Onan diesel-fired emergency generator.

DESCRIPTION OF PROCESS/MODIFICATIONS

Existing Facility

The Piney Creek Wastewater Treatment Plant is a standard municipal wastewater treatment facility serving the greater-Beckley area. The facility can receive up to a maximum design flow of 8.0 million gallons per day (MGD) of influent from twenty-three (23) area pumping stations. The

influent is then treated in one of two parallel processes: either a 4.5 MGD sequencing batch reactor (SBR) or a 3.5 MGD waste-activated sludge process. Solids in both processes go through two 400,000 gallon anaerobic digesters and are dewatered on belt filter presses before being land applied during the summer or land-filled in the winter. Final treatment of the liquids using ultraviolet disinfection occurs before introduction of the cleaned water into Piney Creek. Currently, biogas created during the digester process is combusted in one of two existing, grand-fathered (for permitting processes) boilers. Biogas generated in these processes typically is a highly moist mixture made up primarily of methane (~ 60 - 65%) and carbon dioxide (~ 35 to 40%).

Proposed Modifications

The BSB is now proposing to modify the facility by installing a Varec Model Number 244W (6" diameter) non-assisted, design-capacity 9,520 ft³/hr (based on a MOP 8 guidelines) elevated flare to combust excess biogas produced in the existing digesters. Based on an average biogas heat content of 621 Btu/ft³, the maximum design heat input of the flare can be calculated at 5.91 mmBtu/hr. The flare is expected to burn no more than a maximum of 7,746 ft³/hr of biogas based on worst-case conditions. The flare is switched on when pressure inside the digester piping exceeds a set threshold via a pressure switch and includes a 0.11 mmBtu/hr continuously lit natural-gas fired pilot light. Combustion of the bio-gas prevents potential odor problems by converting the methane to primarily carbon dioxide and water vapor. The flare is required as the facility plans to be accepting additional grease-trap influent that will increase the amount of biogas beyond which the existing boilers are capable of handling.

SITE INSPECTION

Due to the nature of the proposed modification, the author did not perform a site inspection of the facility for this permitting action. The facility was last inspected by DAQ Compliance/Enforcement (C/E) Inspector Mr. John Money Penny on September 15, 2010. This inspection found the facility be "Status 30 - In Compliance."

AIR EMISSIONS AND CALCULATION METHODOLOGIES

BSB included in Attachment N of the permit application an emission estimate for the proposed Varec Model Number 244W (6" diameter) non-assisted, design 9,520 ft³/hr (based on a MOP 8 guidelines) elevated flare. While quality emission factors for criteria pollutants produced when combusting biogas are not readily available, as biogas is predominately methane, surrogate emission factors may be used to reasonably estimate potential emissions. To this effect, BSB used available emission factors from AP-42 Section 2.4 - "Municipal Solid Waste Landfills" to estimate the emissions of CO, NO_x, and PM_{2.5}/PM₁₀/PM (note they used the current emission factors and not the draft factors now available). Landfill gas (LFG) is very similar in characteristics (made up of methane and carbon dioxide) as biogas. For SO₂ and VOCs, as no emission factors are given for the flaring of LFG, BSB used emission factors provided for natural gas combustion as given in AP-42 Section 1.4. AP-42 is a database of emission factors maintained by USEPA.

Hourly emissions from the flare were based on the maximum expected gas input to the flare of 7,746 ft³/hr and an average biogas heat content of 621 Btu/ft³ (therefore, giving an expected maximum heat input to the flare of 4.81 mmBtu/hr). Annual emissions were based on operating 8,760 hours per year at the maximum hourly rate. Pilot light emissions were considered negligible.

The following table details the calculated emissions from the proposed flare:

Table 1: Varec Model Number 244W Flare PTE⁽¹⁾

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr)
CO	750 lb/mmft ³ -CH ₄	AP-42, Table 2.4-5	3.78	16.54
NO _x	40 lb/mmft ³ -CH ₄	AP-42, Table 2.4-5	0.20	0.88
PM _{2.5} /PM ₁₀ /PM	17 lb/mmft ³ -CH ₄	AP-42, Table 2.4-5	0.09	0.37
SO ₂	0.60 lb/mmft ³ -CH ₄	AP-42, Table 1.4-4	0.003	0.013
VOCs	5.50 lb/mmft ³ -CH ₄	AP-42, Table 1.4-4	0.03	0.12

(1) Emissions were adjusted downward to reflect the expected worst-case methane concentration of the biogas (65%).

REGULATORY APPLICABILITY

This section will address the potential regulatory applicability/non-applicability of substantive state and federal air quality rules relevant to the flare proposed for the Piney Creek Wastewater Treatment Plant.

45CSR6: To Prevent and Control Particulate Air Pollution from Combustion of Refuse

BSB has proposed use of a flare for combusting excess biogas. This flare will meet the definition of an “incinerator” under 45CSR6 and is, therefore, subject to the requirements therein. The substantive requirements applicable to the unit is discussed below.

45CSR6 Emission Standards for Incinerators - Section 4.1

Section 4.1 limits PM emissions from incinerators to a value determined by the following formula:

$$\text{Emissions (lb/hr)} = F \times \text{Incinerator Capacity (tons/hr)}$$

Where, the factor, F, is as indicated in Table I below:

Table I: Factor, F, for Determining Maximum Allowable Particulate Emissions

<u>Incinerator Capacity</u>	<u>Factor F</u>
A. Less than 15,000 lbs/hr	5.43
B. 15,000 lbs/hr or greater	2.72

Based on the maximum capacity of the proposed flare of (9,520 ft³/hr), and using the density of methane (0.0422 lb/scf), the capacity of the flare in lbs/hr would be approximately 401 lbs/hour (0.20 tons/hr). Using this value in the above equation produces a PM emission limit of 1.09 lb/hr. When operating correctly, there is expected to be only trace amounts of particulate matter from the flare and, therefore, the flare shall easily meet this limit.

45CSR6 Opacity Limits for - Section 4.3, 4.4

Pursuant to Section 4.3, and subject to the exemptions under 4.4, the flare has a 20% limit on opacity during operation. As a primary constituent in the vapors combusted in the unit shall be clean burning methane, particulate matter emissions from the unit is expected to be nominal. Therefore, the unit should easily meet this requirement.

45CSR13: Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation

The Piney Creek Wastewater Treatment Plant Flare does not have a maximum potential emission rate of a regulated pollutant in excess of the thresholds given under Section 2.17 of 45CSR13 that would define the construction of the proposed flare as a “modification” and require Ashland to get a permit prior to beginning construction. However, under Section 2.24 of 45CSR13, included in the definition of a “stationary source” is any facility that “is subject to any substantive requirement of an emission control rule promulgated by the Secretary.” Based on long-standing DAQ policy and the “dual-definition” of a source, this test is also applied to proposed changes to determine if they meet the definition of modification. In the case of the proposed flare, it does trigger a substantive requirement of 45CSR6 (see above) and, therefore, is defined as a modification. Pursuant to §45-13-5.1, “[n]o person shall cause, suffer, allow or permit the construction . . . and operation of any stationary source to be commenced without . . . obtaining a permit to construct.” Therefore, BSB is required to obtain a permit under 45CSR13 for the construction and operation of the biogas flare.

As required under §45-13-8.3 (“Notice Level A”), BSB placed a Class I legal advertisement in a “newspaper of *general circulation* in the area where the source is . . . located.” The ad ran on September 27, 2016 in *The Register-Herald* and the affidavit of publication for this legal advertisement was submitted on October 31, 2016.

45CSR30: Requirements for Operating Permits - (NON APPLICABILITY)

45CSR30 provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. The Piney Creek Wastewater Treatment Plant does not meet the definition of a “major source under § 112 of the Clean Air Act” as outlined under §45-30-2.26 and clarified (fugitive policy) under 45CSR30b. Additionally, there is no indication that the facility is, based on the applicability of a federal performance standard, subject to Title V as a “deferred” area source. Therefore, the facility is not subject to 45CSR30.

TOXICITY ANALYSIS OF NON-CRITERIA REGULATED POLLUTANTS

This section provides an analysis for those regulated pollutants that may be emitted from the flare proposed for the Piney Creek Wastewater Treatment Plant and that are not classified as “criteria pollutants.” Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO_x), Ozone, Particulate Matter (PM₁₀ and PM_{2.5}), and Sulfur Dioxide (SO₂). These pollutants (with the exception of PM) have National Ambient Air Quality Standards (NAAQS) set for each that are designed to protect the public health and welfare. Other pollutants of concern, although designated as non-criteria and without national concentration standards, are regulated through various federal programs designed to limit their emissions and public exposure. These programs include federal source-specific Hazardous Air Pollutants (HAPs) limits promulgated under 40 CFR 61 (NESHAPS) and 40 CFR 63 (MACT). Any potential applicability to these programs were discussed above under REGULATORY APPLICABILITY.

The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. BSB has not identified any substantive amounts of non-criteria regulated pollutants potentially emitted from the flare proposed for the Piney Creek Wastewater Treatment Plant.

AIR QUALITY IMPACT ANALYSIS

The proposed construction does not meet the definition of a “major stationary source” pursuant to 45CSR14 and, therefore, an air quality impact (computer modeling) analysis was not required. Additionally, based on the nature of the construction, modeling was not required under 45CSR13, Section 7.

MONITORING, COMPLIANCE DEMONSTRATIONS, RECORD-KEEPING, AND REPORTING REQUIREMENTS

The following substantive monitoring, compliance demonstration, reporting, and record-keeping requirements (MRR) shall be required:

- ! To demonstrate compliance with 4.1.2(a) of the draft permit, BSB shall be required to install instrumentation to monitor and record the amount of biogas sent to the flare;
- ! Pilot flame compliance demonstration, monitoring and record-keeping is extensive and shall be required as given under 4.2.1(b) through (e) of the draft permit and may be reviewed there; and
- ! Recording and reporting for visible emissions testing shall be required as given under 4.4.4. and 4.5.1 of the draft permit and may be reviewed there.

PERFORMANCE TESTING OF OPERATIONS

The following substantive performance testing requirements shall be required:

- ! Visible emissions testing to show compliance with 45CSR6 shall be required initially within 180 days of start-up and thereafter at a minimum of at least once per each period of 12 months. Additionally, a visible emission check shall be conducted each time the flare is manually started. Specific visible emissions testing requirements shall be as given under 4.3.1. of the draft permit and may be reviewed there.

RECOMMENDATION TO DIRECTOR

The information provided in permit application R13-3341 indicates that compliance with all applicable state and federal air quality regulations will be achieved. Therefore, I recommend to the Director the issuance of Permit Number R13-3341 to the Beckley Sanitary Board for the modification of the Piney Creek Wastewater Treatment Plant located on Piney Creek Road, Raleigh County, WV.

Joe Kessler, PE
Engineer

Date